Lockheed Martin Idaho Technologies Company

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IDAHO NATIONAL ENGINEERING & ENVIRONMENTAL LABORATORY

# Engineering Design File

for

# Structural Analysis and Design

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Lockheed
Idaho Technologies Company

# ENGINEERING DESIGN FILE

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| PROJECT FILE NO. | WERF-PJ-3212 |
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PROJECT/TASK **WERF Incinerator Hoist Beam**

SUBTASK **Beam Design**

EDF PAGE NO. 1 OF 5

SUBJECT **Structural Analysis and Design**


ABSTRACT

This Engineering Design File (EDF) contains the calculations required to document the design of a beam to support a hoist used to service the WERF Incinerator loading chute. The beam in question will be used periodically to support a hoist which lifts a 1000 lbs load while servicing the incinerator. The beam will not be permanent, and will only be in place during the maintenance operation. The beam will bear on the loading chute and the adequacy of the chute is not contained in this EDF.

Conclusions: A 3"x3"x1/4" structural steel tube will provide a factor of safety of 5:1 on the ultimate loading capacity of the member, assuming a combined load of 1500 lbs. Although not specifically required for a support member such as this, the factor of safety of 5:1 will provide some flexibility for any unknown loading considerations.


References:


1. US Department of Energy Hoisting and Rigging Manual

2. American Institute of Steel Construction, AISC Manual of Steel Construction, 9th Edition.



KEYWORDS (e.g. area, structure no., general subject matter, etc.)

**WERF incinerator, hoist support design**


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PROFESSIONAL ENGINEER REGISTERED 6775 11-4-96 STATE OF IDAHO PATRICK WAYNE BRAGASSA

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**EDF File No. WERF-PJ-3212**

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| LITCO REVIEW | DATE | LITCO APPROVAL | DATE |
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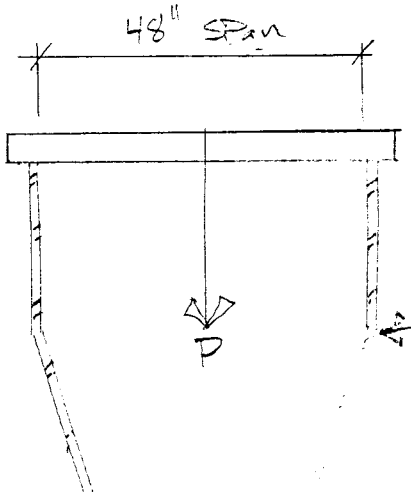
WERF INCIN. BEAM | 11/1/96 | P. BRAGASSA

Design a beam to support a chain fall hoist to lift a load of approximately 1000#. Beam will span 48" across the incinerator loading chute during servicing of the incinerator. Beam will not be anchored and will bear on loading chute, which is not under consideration of this analysis.




30" span also used design for 48" (worst case)

Loading chute
[illegible]
[illegible] TOM Lange 10-31-96

P = 1000# Load

Assume hoist wt + Rigging + MISC = 500#

P = 1500# ↓

$M_{max} = \frac{P\ell}{4} = \frac{1.5(48)}{4} = 18$ K-in

$V_{max} = \frac{P}{2} = 750$#

Doe Hoisting and Rigging Handbook

8.1.12 - Hoists supports shall have a rated capacity at least that equal to the hoist

Considering Impact Load : assume 20% impact per MSC A4.2

$M_{max} = 18(1.20) = 21.6$ K-in

$V_{max} = 750^{\#}(1.2) = 900$#

TRY 3x3x1/4 TUBE STEEL

$S_x = 2.10 \text{ in}^3$

$A = 2.59 \text{ in}^2$

$I = 3.16$

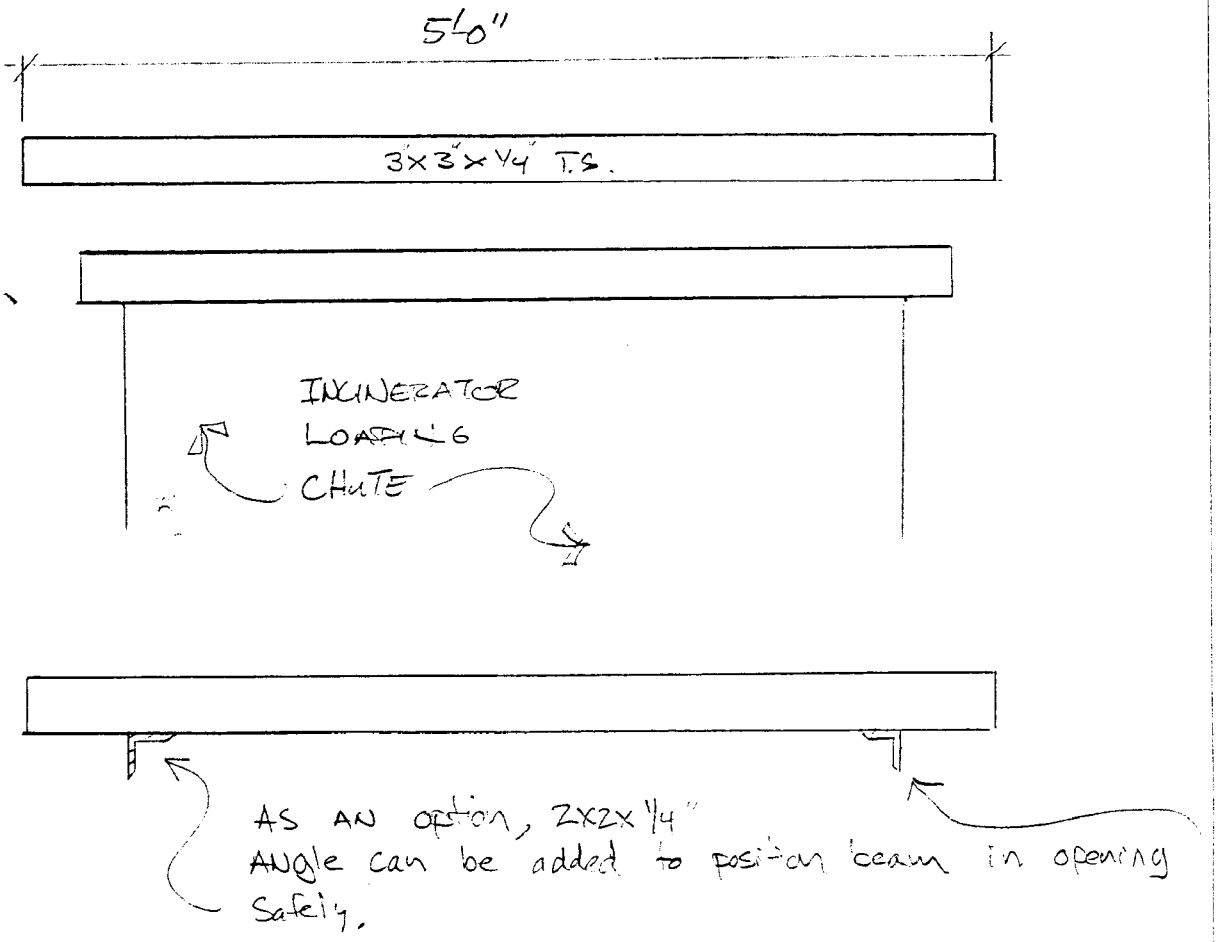
$f_b = \frac{M}{S} = \frac{21.6}{2.10} = 10.29 \text{ Ksi}$

$f_v = \frac{900^{\#}}{2.59} = 348 \text{ psi}$

$F.S. \text{ ult} = \frac{58}{10.29} = 5.64 : 1$

USE 3x3x1/4 S.T. – Tube Steel will provide a flat surface for even distribution of load on chute and will not Roll Like A PIPE.

$\Delta = \frac{Pl^3}{48EI} = \frac{1.5^K(48^3)}{48(29{,}000)(3.16)} = 0.0377''$

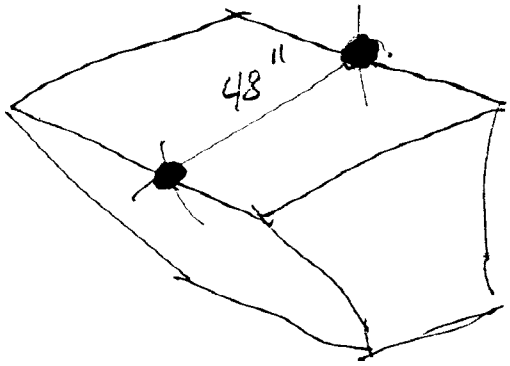


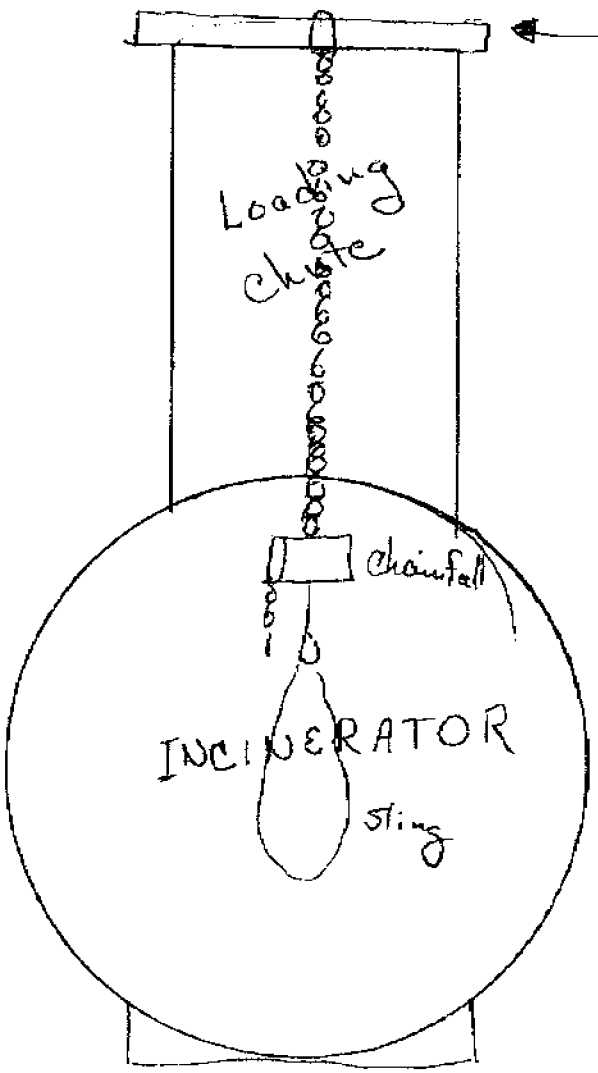
Date: 31 Oct 1996 14:23:14 MDT
Reply-To: <TPL@INELMAIL.inel.gov>
From: "THOMAS P LANGE" <TPL@INELMAIL.inel.gov>
Subject: Load Support
To: "Patrick W. Bragassa" <PWB@ELOI>,
"Christoph A. Schoonmaker" <CXS@INELMAIL.inel.gov>
Comment: INELVM1 TPL 10/31/96 14:21:23 INELMAIL

M/S 8108, 6-7698, PER-641 WERF PLANNER

We have an opening of 48" acroos which we would like to put a sopport to hang a chainfall lift, to lift a load of approximately 1000 lbs. We need to know what we need such as 4x4, metal beam, metal tube, or pipe(diameter & schedual) to safely support this work. We also have an opening of approximately 30" to do the same operation with the same weight. Don Forbes gave me your name as the GURU to determine this. Thank you for you quick and kind attention to this and I'm looking forward to hearing from you.

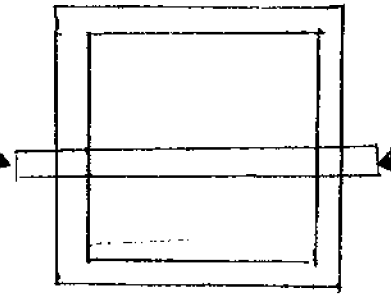
#327301272






End View of Incinerator

Top View of Loading Chute



Support Needed to connect Chainfall

I'm not an artist or draftsmen
But this is it

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